Presentation & management of Common thoracic diseases

Objectives:

- Bronchogenic carcinoma
- Assessment for pulmonary resection.
- Mesothelioma
- Mediastinum
- Pneumothorax
- Emphysema

Resources:

- Davidson's.
- 436 Doctor's Slides
- Surgical recall.
- 435' team work.

Done by: Doaa Walid, Sarah Alshamrani, Rawan Alqahtani, Abdurrahman Almalki.
Leaders: Heba Alnasser, Jawaher Abanumy, Mohammed Habib, Mohammad Al-Mutlaq
Revised by: basel almeflh

Color index:

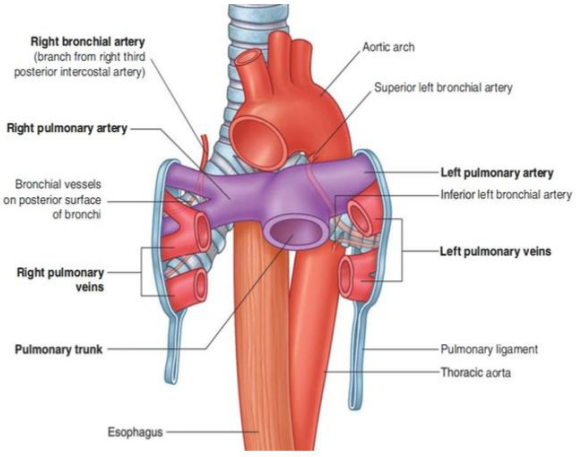
Notes , Important , Extra , Davidson's

Editing file

Feedback

Basic review:

ANATOMY of the Lung:



Lobes and fissures:

- RIGHT LUNG: divided into 3 lobes (upper,middle and lower) by the oblique and horizontal fissures
- LEFT LUNG: divided into two lobes (upper and lower) by the oblique fissure, the Lingular division of upper lobe in the left = middle lobe of the right

Blood supply:

- Lungs don't receive any vascular supply from the pulmonary vessels (pulmonary artery or vein, as they have a different function which is oxygenation of the blood)
- Lungs have a dual blood supply, it receives blood via the Bronchial arteries which arise from Aortic arch (or it could be supplied directly from the aortic arch) or the Intercostal arteries, supplying oxygenated blood to bronchi, lung tissue & visceral pleura.

Clinical aspect: the blood supply to the lungs as an organ is very poor, that's why it heals in a very poor way in compare to the liver for example.

- ***Bronchopulmonary segments:*** each of the tertiary bronchi serves a specific bronchopulmonary segment, each segment has Its own artery and is therefore; these are the anatomical, functional, and surgical units of the lungs, you can remove one w/o affecting the others.

Airways:

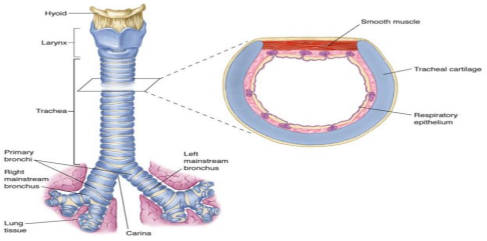
- Trachea, primary bronchi, secondary bronchi, tertiary bronchi out to 25 generations of progressive smaller branches.
  - All comprised of hyaline cartilage

- **Trachea:**
  - Begins where larynx ends (about C6 - below cricoid cartilage), and ends at T4 (bifurcates to primary right and left bronchi (the site of primary carina))
  - 10 cm long, half in neck, half in mediastinum superior & behind the manubrium

  20 U-shaped rings of hyaline cartilage, keeps lumen intact but not as brittle as bone

It has a cartilage anteriorly, Posteriorly it is Membranous with smooth muscle because it's in contact with esophagus.

Tracheoesophageal fistula due to pressure necrosis of the posterior wall of the trachea (**emergency**).



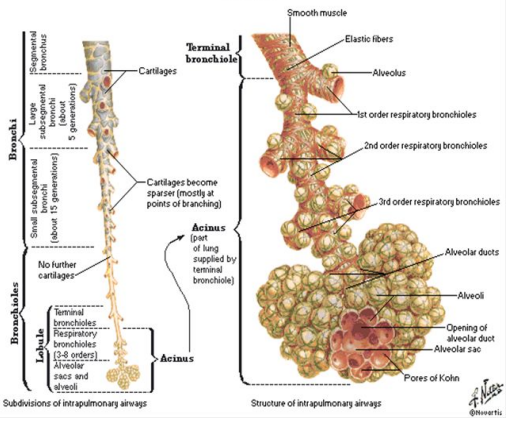
- *Causes:*
  - Prolonged intubation (balloon inflation), for example if the patient was intubated for a long time (such as in ICU) and we inflate the tracheostomy very hard or with uncontrolled pressure.
  - Pressure of NasoGastric Tube and cervical vertebra.

Treatment : tracheotomy

- Lined with epithelium and cilia, which work to keep foreign bodies/irritants away from lungs

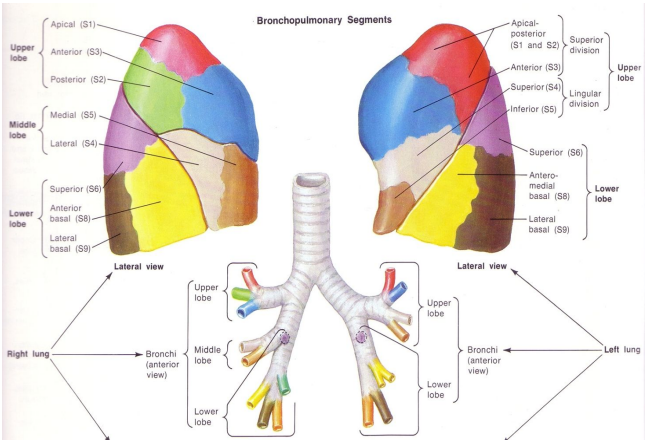
- immotile ciliary syndrome or ***Kartagener syndrome*** (in children) and **Mucoviscidosis *"cystic fibrosis"*** *they have defect in the cilia or cilia motility which lead to accumulate of foreign body or secretion in the lung and induce inflammatory process and later on the patient may have suffering from severe cough and infection and end usually with complete destruction of both lungs which eventually need lung transplant.*

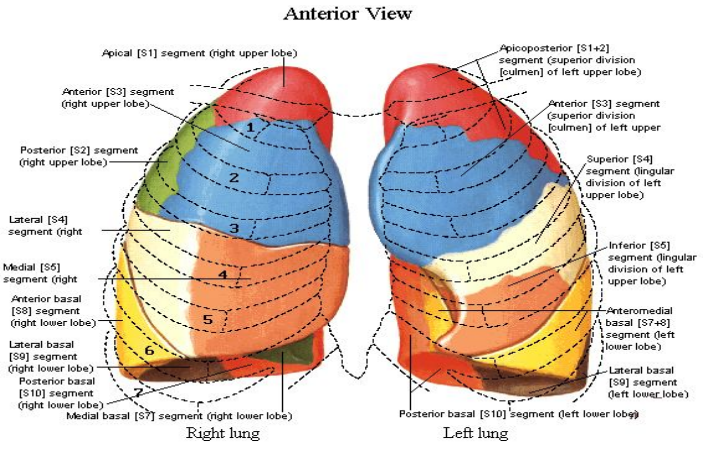
- **Bronchioles:**
  - First level of airway surrounded by smooth muscle; therefore can change diameter as in bronco-constriction and bronco-dilation
    - Right primary bronchus is shorter, wider, and more vertical than the left primary bronchus. Therefore when foreign bodies get aspirated, they often lodge to the right main bronchus (wider).
  - Terminal bronchioles
  - Respiratory bronchioles 3-8 orders
  - **Alveoli.**



Bronchopulmonary Segments - for your information only

RIGHT	LEFT
Upper lobe	**Upper lobe**
Apical (S1), Posterior (S2), Anterior (S3)	Apico-posterior (S1+S2), Anterior (S3)
Middle Lobe	**Lingular division of upper lobe**
Lateral (S4), Medial (S5)	Superior lingular (S4), inferior lingular (S5)
Lower Lobe	**Lower Lobe**
Superior or Apical lower (S6), Medial basal (S7), Anterior basal (S8), Lateral basal (S9) and Posterior basal (S10)	Superior or Apical lower (S6), Anterior-medial basal (S7+8) (no medial segment, think of it is the place for the heart and left ventricle) , Lateral basal (S9) and Posterior basal (S10)
Total of 10 segments	**Total of 8 segments,** (Apico-posterior one segment - no medial segment in lower lobe)

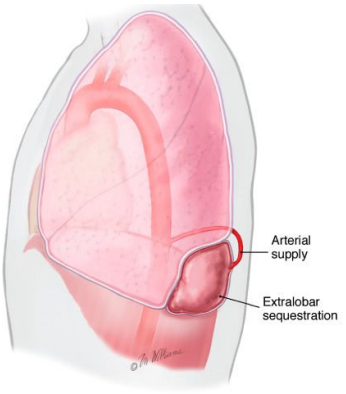




LUNG DISEASES

Congenital:

- **Agenesis:** Absence of the lungs, (a child with one lung only for example).
- **Hypoplasia:** Incomplete development of the lungs, so a patient may present with small lungs (not functioning).
- **Cystic adenomatoid malformation**
  - Abnormal embryogenesis. Usually an entire lobe of the lung is replaced by a non-functioning cystic area. And a child may present with repetitive chest infection, needs surgery.
- **Pulmonary sequestration** also called Accessory lung**:**
  - Divided into intralobar and extralobar sequestration
  - It consists of a nonfunctional mass of normal lung tissue that **lacks normal communication** with the airways.
  - A part of the lung loses its connection from the major bronchial tree, so all of secretion in this part will accumulate there and the patient presents with repetitive infection, sometimes it is misdiagnosed as asthma.
  - It can be extra-lobar or intra parenchymal. Located in the **left lower lobe** most of the time.
  - It is characterized by receiving its own arterial blood supply from the systemic circulation (especially thoracic aorta, it could be two or three major artery). So the surgeon should identify the blood supply (in case of resection) by CT scan with contrast to locate the blood supply (these vessels could be above, below, or directly on the diaphragm) to prevent massive bleeding, so we have to control the abnormal systemic blood supply coming from a major Aorta.



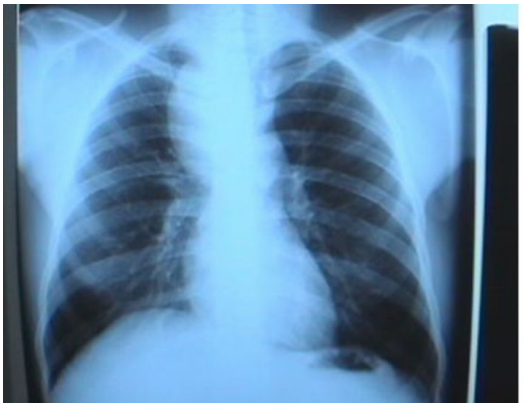
- **Lobar emphysema** could be congenital.
  - **Emphysema is characterized** by progressive **loss of interalveolar septae,** Large air spaces are formed throughout the lungs, which become grossly enlarged with severely affected areas that are neither ventilated nor perfused. This causes progressive loss of respiratory function, culminating in respiratory failure and death.
  - In less than 10% of cases, however, it can also result from a deficiency of **α1-antitrypsin**, affecting younger patients from the **third decade** and having a **lower lobar distribution**.
  - It could affect children and newborns, the entire lobe is replaced with big cyst or emphysematous bullae, so the newborn is not able to breath and need to be on ventilator. When we put them on ventilator the emphysematous bullae become larger and start to compress the other parts of the lung. So to relieve the patient from the ventilator, we have to take this big bullae out and remove the entire lobe surgically.

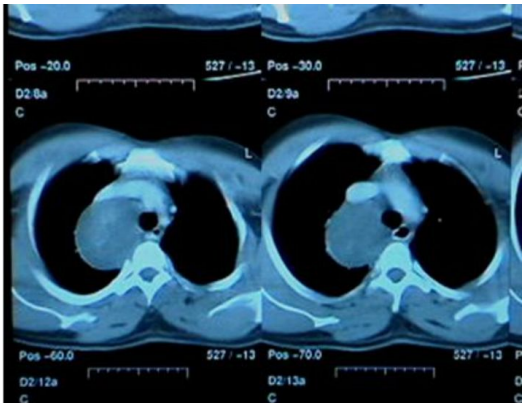
- **Bronchogenic cyst:** (benign cysts with malignant position[1])
  - **Location:**
    - Paratracheal (right) most common
    - Subcarinal[2]

- They consist of semisolid cartilaginous material that secretes cheesy like material that is prone to infections.
- May lead to serious complication when it increases in size leading to hemorrhage and compression of the surrounding structures (I.e. trachea, esophagus).
- Could be asymptomatic and founded incidentally. Or presents with symptoms : SOB, stridor, cough and dysphagia or it could be very severe dyspnea and may differ with position.
- If it is not treated for a long time it could transform to adenocarcinoma.

[1] " it has a توضّع effect, like meningioma, it's benign but because of its mass effect it causes severe symptoms"
[2] Below the bifurcation of trachea

- **Work up:**
  - Full history and examination
- **Treatment:** Excise the cyst to: Establish diagnosis, prevent infection or bleeding, prevent transformation to malignant adenocarcinoma.. But **mainly, you remove it to relieve the compression on the structure.**

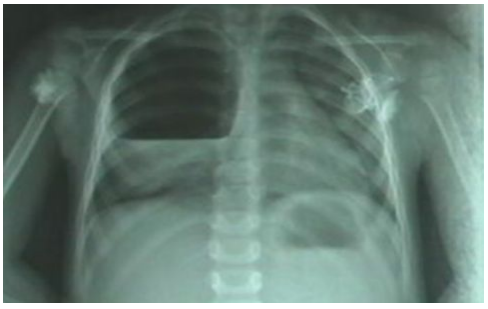




  - Investigation: CT or CXR which shows over-inflation of the affected lobe (radiolucency).
  - (radiolucency=black) while (radiopaque=white)
  - There is a big cyst posterior to superior vena cava and near to trachea, if it increases in size, it will compress on trachea or esophagus, could even lead to compression of SVC and massive bleeding.

Infectious:

- **1/Lung Abscess:** (inside lungs' parenchyma)
  - **Causes:**
    - As a complication of pneumonia, bronchial obstruction (by tumor or inhaled foreign bodies esp. In children) bacteremia, and **septic emboli**. **Could be due to:**
      - Renal failure
      - Showering emboli
      - Immunocompromised (Diabetic, HIV, etc)
      - Leukopenic
      - Superinfection
  - **Clinical features:**
    - High fever & chills
    - Severe chest pain
    - Cough and hemoptysis
    - Copious production of foul smelling sputum (pus like)
    - Leukocytosis



-Air-fluid level appearance in the right upper zone(two-dimensional)
- When we have fluid in pleura it doesn't look like that, it will give crescent line and disappearance of angle. air-fluid level could be intra-pleural or intra-bronchial within the lung.

This patient has large abscess cavity, his general condition is very poor with very high temperature and fever and very septic, he is coughing up copious production of foul smelling sputum. The patients are usually immunocompromised such as HIV or renal failure or part of generalized disease.

  - **Work up:**
    - Full history and examination
    - Investigation: CXR (thick cavitation+air fluid level), CT (to differentiate b/w abscess and empyema)
  - **Treatment:**
  - ***It's a benign condition so you aim for a conservative approach***
    - Drainage (surgical)
      - Internal: bronchoscope
      - External: Percutaneous Tube Drainage
    - Antibiotics (non-surgical)

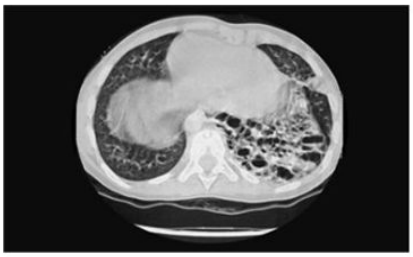
- **Pulmonary resection**
  - **Indications of resection:**
    - Failure of medical RX
    - Giant abscess (>6cm)
    - Hemorrhage
    - Inability to rule out carcinoma. Squamous cell carcinoma is usually central and is complicated by abscess formation. (eg, 60 years old, heavy smoker presents with cough and hemoptysis and unexplained weight loss).
    - Rupture with resulting empyema (presence of infected fluid in the pleural cavity).
  - **Types of resection:**
    - Lobectomy (main) or Bi-lobectomy
    - Or segmentectomy
    - Pneumonectomy

2/Bronchiectasis:

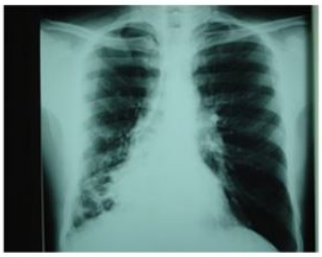
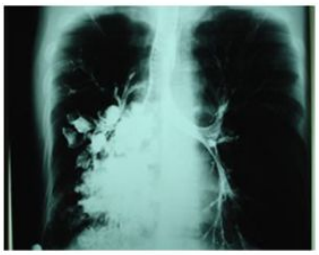
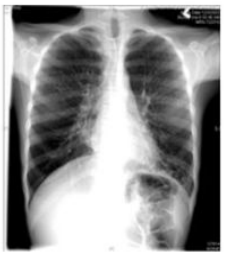
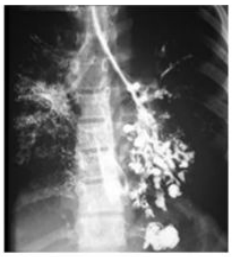
- **Definition:** Bronchial dilation, usually affecting the lower lobes
- **Causes:**
  - **Congenital: (bilateral)**
    - Mucoviscidosis (Cystic fibrosis)
    - Immotile ciliary syndrome (Kartagener syndrome)
  - **Infections:** (rare now due to the development of vaccination)
    - Childhood infection, in the past any measles patient may get complicated with bronchiectasis.
    - Repeated pulmonary infections or pneumonia.
    - Certain lung diseases will lead as a complication to bronchiectasis
  - **Obstruction:**
    - Inhaled foreign body, when the child start to crawl and eat foreign bodies such as organic seeds, he might inhale them because the swallowing process is not developed yet, leading to obstruction of the bronchial tree. Usually to the right main bronchus because right primary bronchus is shorter, wider, and more vertical than the left primary bronchus. So (GP must refer straight away the pt to the thoracic surgeon in this case by taking proper history (the family may say: the child was normal and suddenly he started coughing and got out of breath but then everything got normal and he started breathing normally again. Another scenario: a child was normal then after 2 years he was misdiagnosed as asthmatic with no family history of asthma, and no medications were working for him.. You have to suspect obstruction in this case). If it was metalic, it will be easy to detect it by CT or CXR, but most of foreign bodies are not shown in imaging.
    - To sum it all up, obstruction won't make the secretions of the lung to be excreted, leading to a collapse of the lung and chest infection and finally bronchiectasis
    - Tumors
- **Clinical features:**
  - Productive cough (in the morning every day due to collection of secretion during sleep)
  - Dyspnea
  - Haemoptysis (50%)
  - **Clubbing**
- **Types:**
  - Cystic
  - Cylindrical

- **Investigation:**
  - Bronchogram invasive
  - CT High-resolution **> diagnostic study of choice.**
  - Bronchoscopy not commonly used nowadays
  - CXR (cystic formation) > initial test.

CT scan



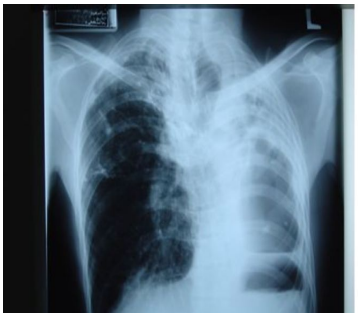
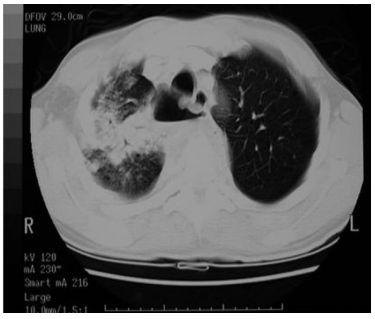
Bronchogram

- **Treatment:**
  - **Medical**:(Cylindrical type? Yes; Perfused? Yes > Medical), usually reserved for bilateral disease.
    - Resolves most cases (Antibiotics, bronchodilator, physiotherapy)
  - **Surgical indications:**
    - Failure of medical Rx
    - Unilateral localized disease
    - If bilateral, lung transplantation is necessary
    - cystic dilation.
    - Non-perfused (by V/Q scan)
      - Most cystic types are non perfused, while most cylindrical are perfused.

3/Tuberculosis:

- 30,000 new cases occur annually in U.S.A
- **Causes:**
  - **Pulmonary:**
    - TB empyema (not pyogenic)
  - **Extra-pulmonary:**
    - In thoracic surgery or in mediastinum →
    - pleural cavity(TB empyema and pyogenic)
    - TB lymphadenitis(lymph node of mediastinum)
    - Pott's disease (in vertebra)
    - Tuberculoma (in meningitis)
- **Investigation:**
  - **CXR**
  - AFB (acid-fast bacillus) sputum culture (if positive confirms TB)
  - Tuberculin skin test (latent TB)
  - Bronchoscopy
  - **Chest CT scan (infiltration, abscess formation, lymph nodes)**
  - Mediastinoscopy (caseating granuloma)

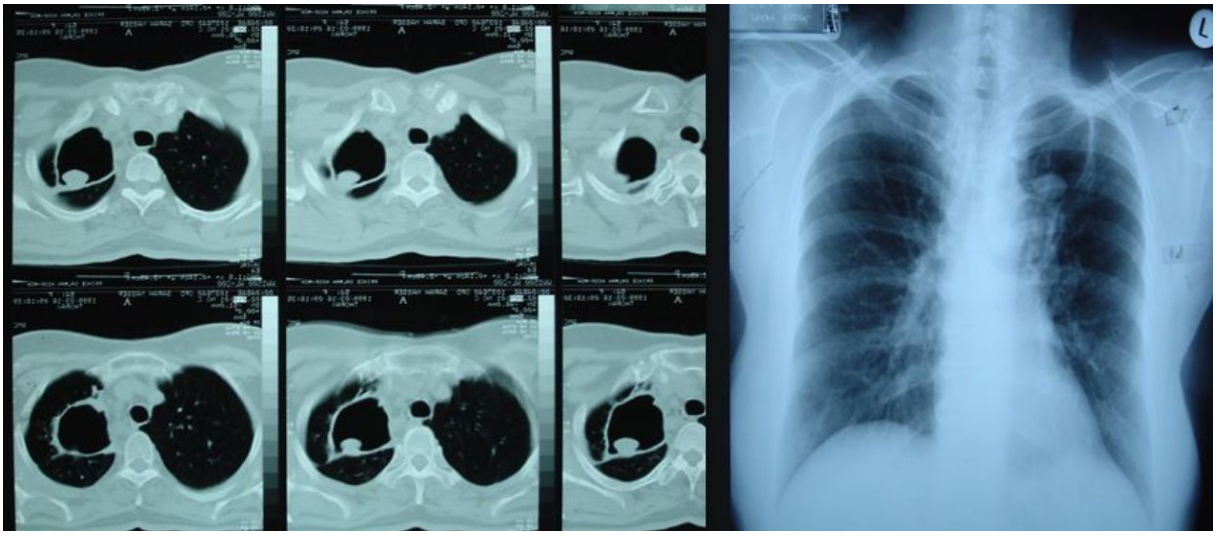



1st picture: There is destruction of left lung due to TB and the trachea is pulled away or shift it to the left due to fibrosis and lung collapse.
2nd picture: destruction of the lung with fistula between the lung and mediastinum.

- **Treatment:**
  - Medical : effective in most cases (isoniazid (INH), rifampin, pyrazinamide, and ethambutol)
  - Surgical indications:
    - Failure of medical Rx **(Multidrug resistant)**
    - Destroyed lobe or lung
    - Pulmonary haemorrhage, or massive hemoptysis.
    - **Superinfection** (inf. Occurring on top of earlier one)
    - Persistent open cavity with + ve sputum
    - Persistent bronchopulmonary fistula (persistent pneumothorax)
    - Empyema

4/Aspergillosis:

- **Causes:**
  - Aspergillus fumigatus, Aspergillus niger
- **Mode of transmission:**
  - Inhalation of airborne conidia
  - Contaminated water (while showering)
  - Nosocomial infections
  - Esp. in immunocompromised patients (HIV, TB,hepatitis, etc…)
- **Forms:**
  - Allergic
  - Saprophytic (aspergilloma/mycetoma)
    - Characterized by Asp infection with no tissue invasion, usually with underlying TB and/or sarcoidosis
  - **Invasive,** Affects mainly immunocompromised pts in the upper lobe
- **Saprophytic form:**
- **Clinical findings:**
  - Aspergilloma/mycetoma cavity ball-like in CT
  - Comes with a warning sign of **hemoptysis (50%)** (patient with preexisting Disease) >very high mortality and morbidity
  - Chronic productive cough
- **Investigations:**
  - Skin test
  - Sputum fungal culture
  - Biopsy (Invasive)
  - CXR (radiolucent) or CT (if there are air crescent sign + aspergilloma> diagnosis will be TB)



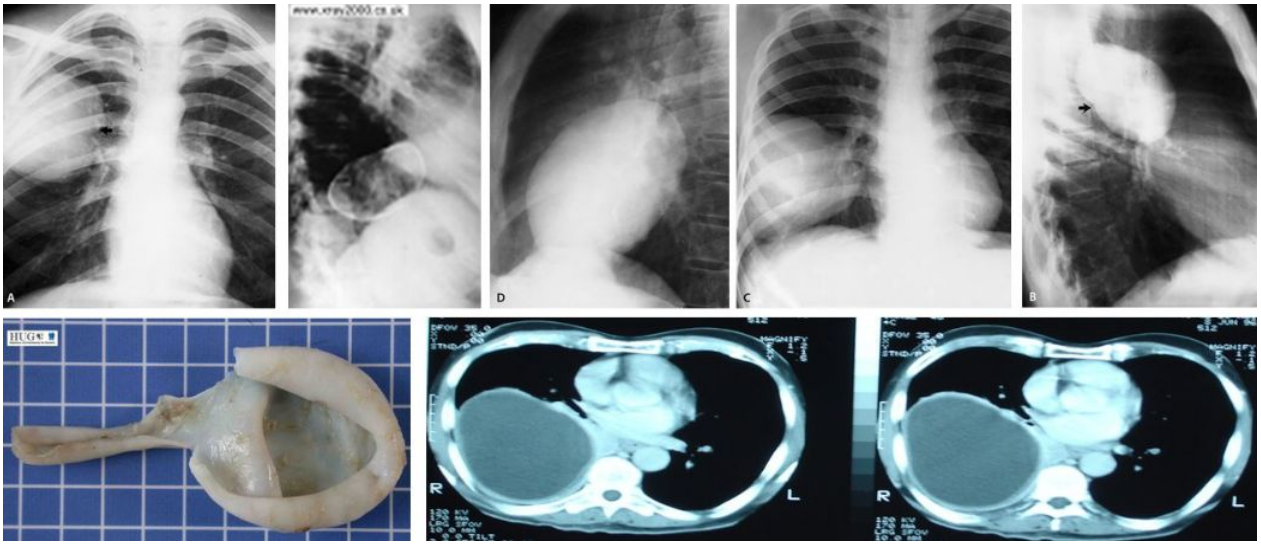
It is characterised by a Cavity and a fungal ball (mycetoma) or aspergilloma complex, movable when you change the pt position(supine/prone) in CT scan.

- **Treatment:**
  - Medical IV antifungal (amphotericin B)
  - Surgical: ***Indications:***
    - A significant aspergilloma
    - Haemoptysis
      - ***Type of resection***
        - Lobectomy (surgical operation where a single lobe is removed)
        - Segmentectomy (surgical removal of a segment of a lung lobe).
        - Pneumonectomy (If associated with TB destroying the whole lung)

5/Hydatid cyst

- Parasitic infestation by Echinococcus granulosus (tapeworm)
- Asymptomatic or symptomatic (compression by cyst will cause dyspnea)
- The liver is the first and most common organ involved, followed by the lungs. That's why in any patient with hydatid cyst we have to screen the liver and other organ, can affect bones, pancreas and brain.
- **Cause:**
  - Echinococcus granulosus.
- **Transmission:**
  - Definitive host Dog/cat (feces) to intermediate host sheep (grass) to poor human (those who eat raw liver)
- **Hydatid cyst Layers:**
  - The outer pericyst is composed of host cells that are formed as a reaction to the parasite (false layer)
  - The middle Laminated membrane (external layer of cyst)
  - The inner Germinal layer (gives eggs)
- **Investigation:**
  - Skin test (Casoni's reaction)
  - CXR
  - CT scan (a chronic cyst appears calcified on CT can be found incidentally or after complications)
  - High echinococcus titers and other serologic tests, so highly infectious.
  - Routine blood work (nonspecific)
    - Any pt with hydatid cysts anywhere must be routinely screened for cysts in the liver

It is contraindicated to use a needle in his case when we diagnose. Because one of the Serious complications of hydatid cyst is the risk of anaphylactic shock, following rupture of the cyst.



- *Large opacity in:*
  - upper right zone and right upper lobe (lateral view)
  - Lower right zone and right lower lobe (lateral view)
  - capsules are filled with embryo, you fill it with hypertonic saline to kill the embryo before opening the cyst.
- **Treatment:**
  - **Aspiration by needle is contraindicated**.
  - Surgical : Excise the cyst (surgeons must be careful when doing this procedure, b/c if it ruptures it will spill millions of scolex into surrounding cavities which leads to the formation of new cysts! That's why we use a hypertonic saline before excision to kill those scolex first). but if there are multiple cysts in multiple organs > chemo is indicated.

Recall:

What is it Hemoptysis? Bleeding into the bronchial tree
What are the causes?
1. Bronchitis (50%)
2. Tumor mass (20%)
3. TB (8%)
4. Other: bronchiectasis, pulmonary catheters, trauma

What is the usual cause of death?
Asphyxia (choking due to a lack of oxygen not hemorrhagic shock)
Which arterial system is most often the source of massive hemoptysis?
Bronchial (not pulmonary) arteries
What are the signs/symptoms of lung abscess?
Fever, productive cough, sepsis, fatigue
What are the associated diagnostic studies?
CXR: air-fluid level
CT scan to define position and to differentiate from an empyema
Bronchoscopy (looking for cancer/culture)
What is the treatment?
1. Antibiotics and bronchoscopy or culture and drainage
2. Percutaneous drainage
3. Surgical resection if nonoperative management fails or underlying cancer

Lung tumors:

- Benign
- Malignant:
  - Primary
  - Secondary

Primary lung carcinoma

➢ **Incidence:** Worldwide, lung cancer is the **most common cause of cancer death.**
➢ **Risk factor**: Smoking (most important).
others: radiation, industrial chemicals, diet, genetic factors, radon. The combination of asbestos exposure and cigarette smoking produces a many-fold increase in risk.

➢ **Pathology:**
With the exception of alveolar cell carcinomas, which arise from cells lining the alveoli, Primary lung cancers arise within the bronchial epithelium and are hence termed bronchogenic carcinoma.

➢ **Classification:** 1- Non-Small Cell Carcinoma. 2- Small Cell Carcinoma. We divide them according to their difference in management

NSCLC	SCLC
• Epithelial origin • 75-80% 1. Adenocarcinoma (40%) peripherally located 2. Squamous cell carcinoma: (30%) centrally located. 3. Large cell carcinoma.(9%) peripherally located.	• Neuroendocrine origin • 20-25% • centrally located • Poor prognosis • patient usually presents with systemic disease.
➢ **Management:** ○ Depends on: - Stage - Cell type - Patient physical fitness	
• Treatment of NSCLC: - Surgical (always preferred in early stages and if limited to the lung) - Neoadjuvant chemotherapy (intermediate stage) > means before surgery to down stage the tumor - Radiotherapy \ Chemotherapy	• Treatment of SCLC: ○ **Non surgical** (because tumor is usually discovered late when metastasis has already happened, and it involves a lot of organs in the body) ○ (**chemotherapy** only +\- radiotherapy).

➢ **Clinical features:** according to the tumor location (peripheral or central). Peripheral lesions may grow to 8 cm or more before causing local symptoms such as chest wall pain. Central lesions tend to occlude the airways, causing varying degrees of pulmonary collapse and consolidation

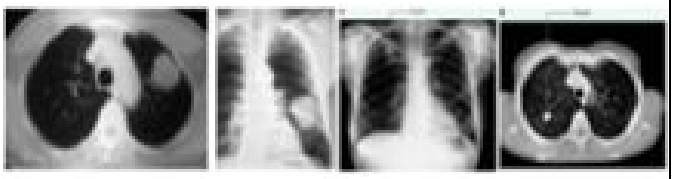
- Asymptomatic: found incidentally on CXR
- Symptomatic:
  - ➔ Lung: (mostly cough, hemoptysis..)
  - ➔ General manifestations: (loss of appetite, fever, weight loss, fatigue)
  - ➔ Surrounding structures (by compression)
    - ◆ Recurrent Laryngeal nerve (hoarseness)
    - ◆ Oesophagus (dysphagia)
    - ◆ C8, T1 nerve (severe brachial plexus pain or shoulder pain, ex.: pancoast tumor "superior sulcus tumor")
    - ◆ Sympathetic chain (horner's syndrome):
      Characterized by the classic triad of: miosis, partial ptosis and loss of hemifacial sweating(i.e., anhidrosis).
    - ◆ Pleura (severe pleuritic chest pain if it compress it, or malignant pleural effusion if it invades)
    - ◆ SVC (SVC obstruction syndrome, can also happen in hodgkin lymphoma)
  - ➔ Distal (paraneoplastic syndrome)
    - ◆ PTH (hypercalcemia)
    - ◆ ADH (hyponatremia by increasing plasma vol.)
    - ◆ ACTH (cushing's syndrome)
    - ◆ Hypertrophic pulmonary osteoarthropathy (HPOA) (pain and swelling of joints that doesn't respond to medications and improves once tumor is resected).

➢ **Investigations:**
- CXR
- Bronchoscopy

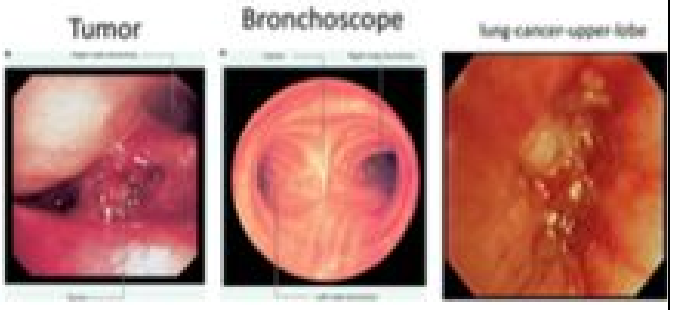
- Transthoracic needle aspiration
- CT Scan (it is the golden choice in staging the tumors)
- MRI (Very poor modality for the purpose of staging , we only order MRI if we suspected an invasion of the soft tissue major structure of apex, like pancoast tumor if there is invasion of vertebra, spinal canal and root brachial plexus)

➢ **Staging:** very important because it tells you about the appropriate management (surgical or not) , early stage or not.
➢ NSCLC: in early stage → surgery. In late stages or metastatic → Radiotherapy \ Chemotherapy or both. In intermediate stage → Neoadjuvant chemotherapy (before surgery to down stage the tumor and its size)
➢ While SCLC → **no surgical intervention only Chemotherapy / Radiotherapy**.

A 65 years old male patient, smoker, presents with hemoptysis, weight loss and loss of appetite, X-ray shows left lower zone opacity, in CT scan we can seen big mass with spike edges and not well contained, this is most likely cancer.



How do we diagnose it ? by transthoracic needle aspiration or by true cut biopsy.
- True biopsy is more accurate and more complicated because we take tissues, it can cause pneumothoracic..



➢ (Dr mentioned that you do not have to memorize it and we will not ask you about it)
➢ N0: no lymph, N1: in the hilum, N2: outside the lung towards mediastinum , N3: supraclavicular or the other lymph node in opposite side “advance”.

NEW INTERNATIONAL REVISED STAGE GROUPING - Tissue Node Metastases	
Stage 0	TIS (carcinoma in situ)
Stage IA	T1, NO (no node), MO (no distant metastasis)
Stage IB	T2, NO, MO
Stage IIA	T1, N1(hilar), MO
Stage IIB	T2, N1, MO
	T3, NO, MO
Stage IIIA	T1-3, N2 (mediastinal), MO
	T3, N1, MO
Stage IIIB	T4, Any N, MO
	Any T, N3 (other side or supraclavicular), MO
Stage IV	Any T, Any N, M1 (metastasis to distant organs)

Secondary lung carcinoma

- Neoplasm that have spread from a primary lesion in another organ.
- secondary lung tumors appear as multiple solitary lung nodules (well marginated, single, mass< 3 cm, intraparenchymal opacity)

➢ **Solitary lung Nodule DDX:**
  - Primary carcinoma
  - Tuberculous Granuloma
  - Mixed tumor
  - Secondary carcinoma (metastasis)
  - Miscellaneous

➢ **Hamartoma - carcinoid** (benign Vs malignant):
  - Carcinoid is potentially malignant (semi benign). It has two types typical and nontypical, usually affects the major airway in middle aged patients. Treatment in early stage is surgical(typical 90% or Atypical(10%) when it goes to lymph node.
  - Age: hamartomas occur primarily in adults > 50 y\o
  - Sex: males 3 times more likely than females
  - X- rays (usually peripherally located)
    - Size (usually small <4 cm in diameter, rounded
    - Time: grows slowly
    - Calcification: sometimes with varying patterns

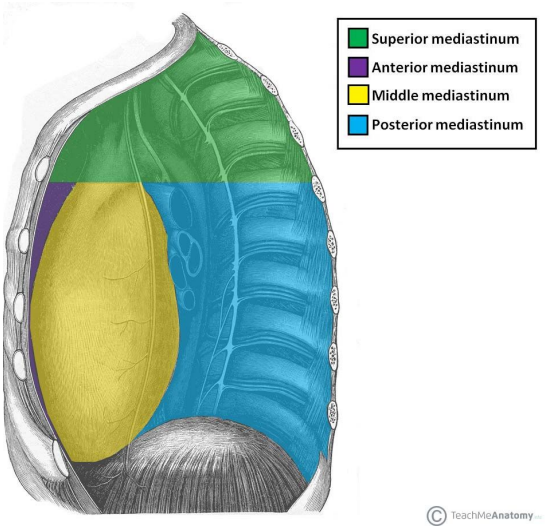
Recall

What is the #1 risk factor for Lung Cancer?
Smoking
What is Pancoast (superior sulcus) tumor?
Tumor at the apex of the lung or superior sulcus that may involve the brachial plexus, sympathetic ganglia, and vertebral bodies, leading to pain, upper extremity weakness, and Horner's syndrome
What is Horner's syndrome?
Injury to the cervical sympathetic chain; think: "**MAP**"
1. Miosis (small pupil)
2. Anhidrosis of ipsilateral face
3. Ptosis
What are the five most common sites of extrathoracic metastases?
1. Brain 2. Bone 3. Adrenals 4. Liver 5. Kidney

Mediastinum: المنصّف

Is the space in the thoracic cavity between the lungs

- **Boundaries:**
  - Superior: thoracic inlet
  - Inferior: diaphragm
  - Anterior: sternum and costal cartilages
  - Posterior: thoracic spine
  - Lateral: mediastinal pleura
- **Divisions**:
  - Traditional.
  - Clinical, as in the table below



- **Access:**
  - Mediastinoscopy endoscope for a biopsy.
  - Mediastinotomy surgical opening called Chamberlain procedure to access the aortopulmonary lymph nodes.
- **Mediastinal mass lesions: to make a DDx when you see an imaging of a mass present in one of these areas.**

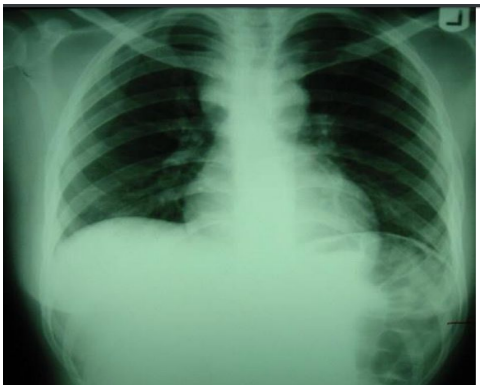
Superior Anterior mediastinum	Middle mediastinal	Posterior mediastinal
5 T's: - Thyroid "retrosternal goiter" - Thymoma - TB lymphadenitis - Teratoma - T cell lymphoma (or triple lymphoma)	Cyst: - bronchogenic cyst - Duplication of Esophagus - pericardial cyst	Neurogenic tumor: dumbbell tumor of neurofibroma and paravertebral mass.

Recall:

What structures lie in the following three mediastinal Compartments:
1- Antero-superior mediastinum?
Ascending and arch aorta, great vessels, thymus, upper trachea, esophagus, lymph nodes.
2- Middle mediastinum?
Heart, lower trachea and bifurcation, lung hila, phrenic nerves, lymph nodes
3- Posterior mediastinum?
Esophagus, descending aorta, thoracic duct, vagus and intercostal nerves,sympathetic trunks, azygous and hemiazygous veins, lymph nodes
What is Superior Vena Cava Syndrome?
Obstruction of the superior vena cava, usually by extrinsic compression
What are the clinical Manifestations of SVC syndrome?
1. Blue discoloration and puffiness of the face, arms, and shoulders
2. CNS manifestations may include headache, nausea, vomiting, visual distortion, stupor, and convulsions.
3. Cough, hoarseness, and dyspnea

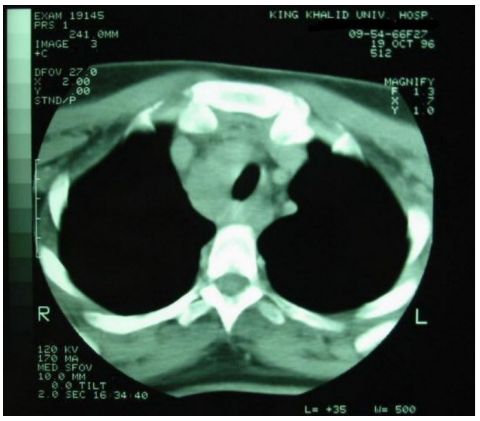
Thymoma

- **Incidence:**
  - The most common tumor of the anterior mediastinum.
  - Peak 40-60y
  - M:F(1:1)
  - If we take 100 patients with Myasthenia Gravis, 15% of them caused by thymoma.
  - If we take 100 patients with thymoma, 40%-50% of them will have Myasthenia Gravis.
- **Pathology**
  - **Classification**
    - Epithelial
    - Lymphocytic
    - Lymphoepithelial
    - Spindle cell
- **Benign OR Malignant**
- **Stages**
  - I (well capsulated), II (invade capsule but not invade surrounding structure) , III (invade surrounding structures (phrenic nerve, pericardium and lung), IV (metastasis)
- **Clinical features:**
  - Asymptomatic
  - Symptomatic
    - Mass effect: SVC syndrome, dysphagia, and cough.
    - Systemic effect: associated autoimmune disorders, most commonly **myasthenia gravis** 40-50%.



➢ **Investigation:**
- All cases:
  - CXR
  - CT Scan
  - BIOPSY
- Selected cases:
  - Bronchoscopy
  - Esophagoscopy
  - angiogram

➢ **Treatment:**
- Benign: complete excision
- Potentially Malignant: start with chemotherapy/radiation before, then complete excision if possible
- Post-op radiotherapy
  - If non-resectable
  - Resection incomplete



Trauma

Trauma is injury is either **blunt** or **penetrating**

❖ **Road Traffic Accident (RTA).**

❖ **Fracture ribs (simple - complicated** with hemothorax**):**
➢ (most common blunt thoracic injuries)

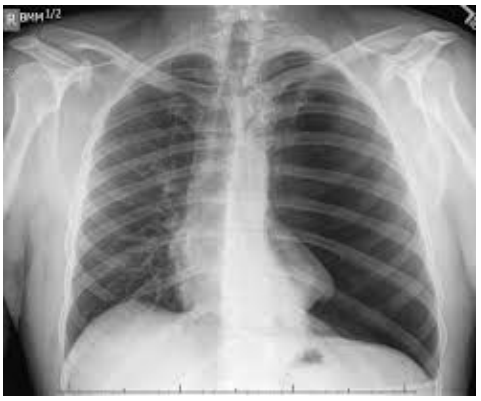
❖ **Haemothorax**:
➢ Accumulation of blood in pleural cavity
- Appears as radio-opacity on CXR.
- Cause is mostly traumatic

➢ **Traumatic Pneumothorax:**
- occurs when air enters the potential space between the visceral and parietal pleura through either an external chest wound or an internal air leak.
- External air entry: occurs with a traumatic chest wall defect, and the resulting open pneumothorax is often associated with a ‘sucking wound’, where air moves in and out of a chest wound with respiration.
- Internal air leakage: may follow esophageal perforation or anastomotic breakdown, as air can enter the pleural cavity via the mouth.However, the most common cause of pneumothorax is leakage of air from the lung, due either to a traumatic puncture wound or to spontaneous leakage from a large (bulla) or small (< 1 cm, ‘bleb’) air sac on the lung surface.

- **Tension pneumothorax:**
  - The pulmonary leak point may have a flap valve mechanism that allows air out of but not back into the lung, causing a rapid buildup of pressure within the pleural cavity,This can be fatal, as the high intrapleural pressure completely flattens the ipsilateral lung while deviating the mediastinum to the opposite side, impeding venous return.

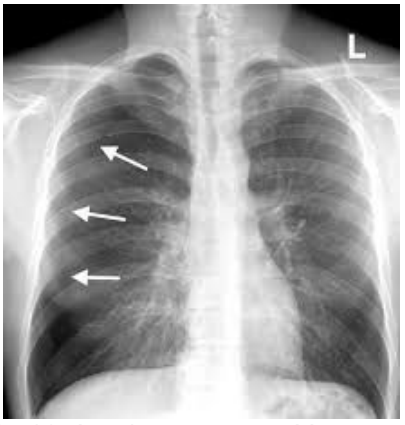
The DX of tension pneumothorax is clinical base not radiological, by assigning respiration and hemodynamic state (it causes obstruction of IVC >> SVC >> aorta >> low cardiac output

- Causes:
  - Mechanical ventilation with associated barotrauma.
  - CPR:
  - Trauma
- Clinical features:
  - Hypotension and tachycardia
  - Distended neck veins
  - Shift of trachea away
  - Decreased breath sounds on affected side
  - Hyperresonance
- Diagnosis: clinically (no time for CXR!)
- Treatment: (Medical emergency!)
  - If tension isn't relieved patient is likely to die from hemodynamic compromise.
  - Immediately decompress the pleural space via large-bore needle or chest tube.



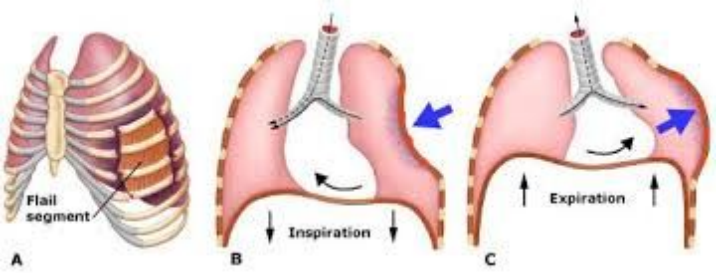
- **Spontaneous pneumothorax:**
  - is described as primary or secondary.
    - Primary pneumothorax typically occurs in young (15–35 years) individuals with essentially normal lungs apart from a few apical bullae or blebs.
    - Secondary pneumothorax develops in elderly patients (55–75 years) with a background of emphysema and chronic obstructive pulmonary disease. It is caused by rupture of a bulla.

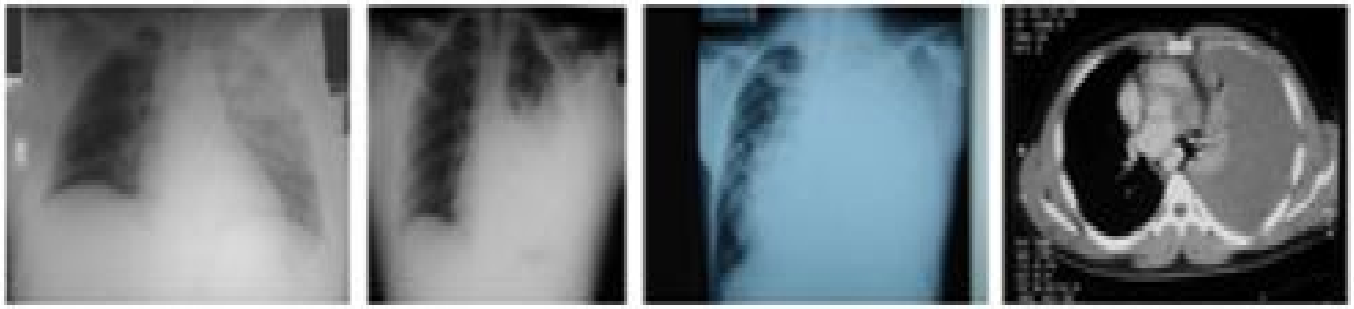
- Clinical features:
  - Sudden ipsilateral chest pain
  - Dyspnea and cough
  - Decreased breath sounds over affected side
  - Hyperresonance over the chest
  - Decreased tactile fremitus
  - Mediastinal shift towards the opposite side of pneumothorax
- Diagnosis: CXR
- Treatment:
  - Primary spontaneous pneumothorax:
    - If small and patient is asymptomatic:
      - Observation (should resolve spontaneously in 10 days) reassess with CXR.
      - Small chest tube may benefit some patients.
    - If larger and/or patient is symptomatic:
      - Administration of supplemental oxygen
      - Chest tube insertion to allow air to be released.
  - Secondary spontaneous pneumothorax:
  - Chest tube drainage.



- **Flail chest:**

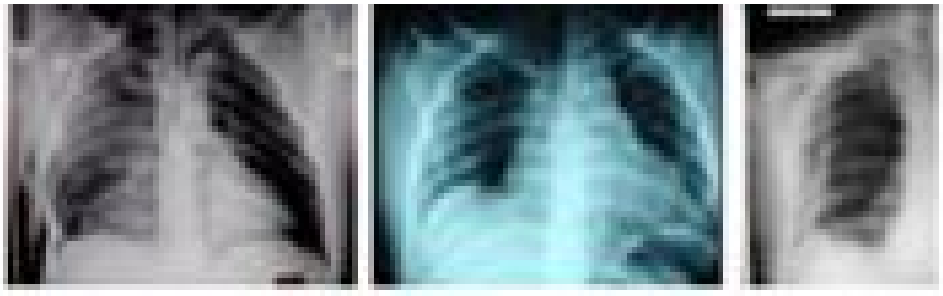
Both ends Fractures of several adjacent ribs (two or more) producing a free unstable segment of chest wall that results in paradoxical movement (you only see it when self ventilated not on machine) should be on. There is usually associated lung contusion[3] (usually the lung is affected too due the trauma).





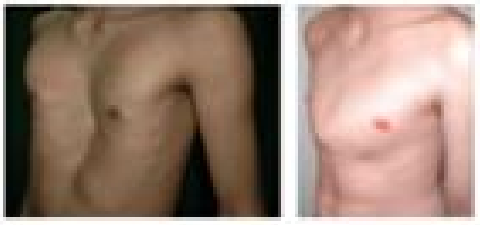
When you say collapse it is a general word, you have to say collapse due to (massive hemothorax, massive pleural effusion, massive empyema, pneumothorax, secretion or foreign body or tumor)

- **Lung contusion and ARDS:**



Chest wall

- Deformities:
  - Pectus excavatum funnel chest (caved-in), need surgery usually.
  - Pectus carinatum “protrusion of sternum”
- Infection: (e.g. abscess, empyema, costochondritis..)
- Chest wall tumor mostly benign
- Thoracic outlet syndrome.
- Treatment: surgery



[3] تكدم الرئة

Pleura

- Spontaneous pneumothorax
- Pleural effusion
- Empyema collection of pus in the pleural cavity.
- ***Mesothelioma:*** rare cancer***: "in objectives"***
  - This causes progressive thickening of the parietal and visceral pleura, with subsequent encasement of the lung and the formation of a large pleural, causing pain and SOB,It is strongly related to a history of asbestos. The patient commonly presents with shortness of breath, owing to a large pleural effusion. In many cases, the diagnosis is made by a percutaneous pleural biopsy but, if this is not successful, thoracoscopy or open pleural biopsy is useful.

Air-way:

- Congenital tracheal anomalies
- Tracheal stenosis
- tracheostomy

Surgery:

- Thoracotomy
- Thoracoscopy
- Sternotomy
- Analgesia

Lung diseases.

- **Congenital:**

-Agenesis: Absence of the lungs, (a child with one lung only for example).
-Hypoplasia: Incomplete development of the lungs, so a patient may present with small lungs (not functioning).
-Cystic adenomatoid malformation Abnormal embryogenesis. Usually an entire lobe of the lung is replaced by a non-functioning cystic area. And a child may present with repetitive chest infection, needs surgery.
-Pulmonary sequestration: A part of the lung loses its connection from the major bronchial tree.
-Bronchogenic cyst: (benign cysts with malignant position), Location: Paratracheal (right) most common, Subcarinal.

- **Infections:**

1-Lung Abscess:
patient presents with: High fever & chills, Severe chest pain, Cough and hemoptysis, Copious production of foul smelling sputum (pus like), Leukocytosis, do CXR and(CT to rule out empyema) , treat with antibiotics , drainage , or pulmonary resection if indicated.
2-Bronchiectasis:
Definition: Bronchial dilation, usually affecting the lower lobes, either **causes:** congenital , infections , obstruction. **Presentation:** Productive cough, Dyspnea, Hemoptysis (50%), Clubbing. **Investigations: CT** is of choice**. Treatment**: medical when bilateral perfused and cystic treat with antibiotics bronchodilators and PT ,surgical if no response to medical or unilateral localized , or when non-perfused cystic .
3- Tuberculosis:
causes: Pulmonary: non pyogenic empyema . Extra-pulmonary: Pott's disease (in vertebra), Tuberculoma (in meningitis) ,TB lymphadenitis(lymph node of mediastinum)**,Investigations**. **Treatment: medical** (antibiotics),surgical if indicated.
4-Aspergillosis:
Causes: Aspergillus fumigatus, Aspergillus niger. **Forms:** Allergic, Saprophytic (aspergilloma/mycetoma) ,Invasive.
Saprophytic form: Clinical findings: Aspergilloma/mycetoma cavity ball-like in CT, hemoptysis (50%) ,Chronic productive cough . **Investigations:** Skin test, Biopsy (Invasive), Sputum fungal culture ,CXR (radiolucent) or CT (if there are air crescent sign + aspergilloma> diagnosis will be TB).**Treatment:** amphotericin b and surgical if indicated.
5-Hydatid cyst:
Cause: Echinococcus granulosus. **Investigations:** CXR ,CT ,skin test. **Treatment:** surgical excision.

Lung tumors:

Investigations: CXR, Bronchoscopy, Transthoracic needle aspiration, CT Scan (it is the golden choice in staging the tumors)
NSCLC: Adenocarcinoma Squamous cell carcinoma Large cell carcinoma. **Treatment of NSCLC:** Surgical (always preferred in early stages and if limited to the lung), Neoadjuvant chemotherapy (intermediate stage) > means before surgery to down stage the tumor ,Radiotherapy \ Chemotherapy.
SCLC: Poor prognosis, patient usually presents with systemic diseases, **Treatment of SCLC** :Non-surgical (because tumor is usually discovered late when metastasis has already happened, and it involves a lot of organs in the body) ,(chemotherapy only +\- radiotherapy).

Mediastinum:

- **Superior Anterior mediastinum:**

5 T's:

- Thyroid "retrosternal goiter"
- Thymoma
- TB lymphadenitis
- Teratoma
- T cell lymphoma (or triple lymphoma)

- **Middle mediastinal**

Cyst:

- bronchogenic cyst
- Duplication of Esophagus
- pericardial cyst

- **Posterior mediastinal**

Neurogenic tumor.

Thymoma

The most common tumor of the anterior mediastinum.
-Classification: Epithelial, Lymphocytic, Lymphoepithelial ,Spindle cell.
-Benign OR Malignant.
-Clinical features :Asymptomatic or Symptomatic (Mass effect: SVC syndrome, dysphagia, and cough.) ,Systemic effect: associated autoimmune disorders, most commonly myasthenia gravis 40-50%.
Investigations :CXR,CT Scan ,BIOPSY. Selected cases: Bronchoscopy Esophagoscopy ,angiogram.
Management : Benign: complete excision ,Potentially Malignant: start with chemotherapy/radiation before, then complete excision if possible.

Trauma

Road Traffic Accident (RTA). Fracture ribs (simple - complicated with hemothorax), Haemothorax, Traumatic Pneumothorax,Tension pneumothorax, flial chest.

Pleura

Spontaneous pneumothorax ,Pleural effusion, Empyema collection of pus in the pleural cavity.
Mesothelioma: rare cancer: This causes progressive thickening of the parietal and visceral pleura, with subsequent encasement of the lung and the formation of a large pleural, causing pain and SOB,It is strongly related to a history of asbestos. The patient commonly presents with shortness of breath, owing to a large pleural effusion. In many cases, the diagnosis is made by a percutaneous pleural biopsy but, if this is not successful, thoracoscopy or open pleural biopsy is useful.

Chest wall:

--Deformities:

-Pectus excavatum funnel chest (caved-in), need surgery usually.
-Pectus carinatum "protrusion of sternum"
-Infection: (e.g. abscess, empyema, costochondritis..)
-Chest wall tumor mostly benign
-Thoracic outlet syndrome.
-Treatment: surgery

Questions in red are VERY IMPORTANT, it might come in the exam!!

Q1. A 32 years old male presented with history of mild chest pain, productive cough especially early in the morning and dyspnea for 6 weeks. He gave history of swallowing a metal object. Chest CT-scan showed cystic abnormality. What is the most likely diagnosis?
A. Bronchiectasis
B. Bronchitis
C. Thymoma
D. Pneumonia

Answer: A, The cause could be Congenital, infectious or obstruction. The productive cough early in the morning is characteristic for bronchiectasis due to the dilatation, secretions accumulate during the sleep.

Q2. In SCLC, which one of the following used for staging?
A. Lung aspiration
B. MRI
C. CT
D. Bronchoscopy

Answer: C

Q3. What is the GOLDEN STANDARD method to investigate primary lung carcinoma?
A. MRI
B. CT scan with IV contrast
C. Chest X-ray
D. Bronchoscopy

Answer: B

Q4. Which one of the following statements are correct regarding SCLC management?
A. Surgery only
B. Chemotherapy to down stage the tumor and then the patient undergo surgery
C. No surgical indication to do any intervention
D. None of the above

Answer: C

Q5. A 20 years old non-smoker male presented with complaints of cough with productive yellowish foul smelling sputum and fever for 3 days. On examination, dullness, decreased breath sound and coarse inspiratory crackles were found. HR= 88 beat/min , respiration= 20 breath/min and his blood pressure was 110/70 mm of hg. What is the most likely diagnosis?
A. Pneumonia
B. Lung abscess
C. Bronchitis
D. Aspergillosis

Answer: B

Q6. In which of the following patients we have to check for thymoma?

A. Lung abscess patients

B. Lymphoma patients

C. SVCS patients

D. Myasthenia gravis patients

Answer: D

Surgical recall: Should myasthenia gravis patients undergo thymectomy? YES, and counterintuitively, myasthenia patients **without thymoma have better symptomatic improvement** after thymectomy than patients with thymoma.

Doctor's note: In every myasthenia gravis patient you should check for thymoma